DOCUMENT RESUME

ED 177 512 CS 005 064

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TITLE Readability of Air Force Publications: A Criterion Referenced Evaluation. Final Report.
INSTITUTION Air Force Human Resources Lab., Brooks AFB, Texas.; Air Force Human Resources Lab., Lowry AFB, Colo. Technical Training Div.
REPORT NO AFHRL-TR-79-21
PUB DATE Sep 79
NOTE 38p.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Cloze Procedure; *Evaluation Criteria; Evaluation Methods; *Military Personnel; *Readability; Reading Ability; *Reading Comprehension; *Reading Level; Reading Research; *Technical Writing; Vocabulary
IDENTIFIERS *Air Force

ABSTRACT

In a study of the readability of Air Force regulations, the writer-estimated reading grade level (RGL) for each regulation was rechecked by using the FORCAST readability formula. In four of the seven cases, the regulation writers underestimated the RGL of their regulation by more than one grade level. None of the writers produced a document with an RGL much below eleventh grade, while the intended audience's RGL for three of the seven regulations was below tenth grade. In the main portion of the study, about 900 Air Force personnel took cloze and vocabulary tests to determine the comprehensibility of each regulation to its user audience. A criterion of 40% on the cloze score, corresponding to a 75% score on traditional comprehension tests, was set as the standard for adequate comprehension. Mean scores in three fields were clearly above criterion, and the score in one additional field was borderline. Using the term literacy gap to refer to a situation where a text is written at an RGL too high for its intended readers, it was found that in all cases in which there was no such gap, comprehension was adequate. In all these cases, however, audience RGL was also quite high. In three of the four instances where a literacy gap did exist, comprehension scores were below criterion and RGL was low (below 9.2). (RL)

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AFHRL-TR-79-21

AIR FORCE HUMAN RESOURCES LABORATORY

ED177512

READABILITY OF AIR FORCE PUBLICATIONS:
A CRITERION REFERENCED EVALUATION

By

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September 1979

Final Report

Approved for public release; distribution unlimited.

AIR FORCE SYSTEMS COMMAND
BROOKS AIR FORCE BASE, TEXAS 78235

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This final report was submitted by Technical Training Division, Air Force Human Resources Laboratory, Lowry Air Force Base, Colorado 80230, under project 1121, with HQ Air Force Human Resources Laboratory (AFSC), Brooks Air Force Base, Texas 78235. Dr. Lydia Hooke was the Principal Investigator for the Laboratory.

This report has been reviewed by the Information Office (OI) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER AFHRL-TR-79-21	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) READABILITY OF AIR FORCE PUBLICATIONS: A CRITERION REFERENCED EVALUATION		5. TYPE OF REPORT & PERIOD COVERED Final
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Lydia R. Hooke Philip J. DeLeo Sharon L. Slaughter		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Technical Training Division Air Force Human Resources Laboratory Lowry Air Force Base, Colorado 80230		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 62205F 11210414
11. CONTROLLING OFFICE NAME AND ADDRESS HQ Air Force Human Resources Laboratory (AFSC) Brooks Air Force Base, Texas 78235		12. REPORT DATE September 1979
		13. NUMBER OF PAGES 36
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Air Force regulations literacy gap readability reading grade level (RGL) rewriting		

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The major objective of this study was to investigate the readability of a sample of Air Force regulations which had been rewritten in accordance with a recent Air Force directive. Regulation writers are directed to match in their texts the target reading grade level (RGL) of the personnel who will use the regulations. The directive also specifies the method for estimating RGLs. In the first part of this study, the writer–estimated RGL for each regulation was rechecked by Air Force Human Resources Laboratory staff using the FORCAST formula. It was found that four of the seven writers underestimated the RGL of their regulation by more than one grade level. None of the writers was able to produce a document with an RGL, as estimated by AFHRL, much below 11th grade, while the audience RGL of three of the seven fields was below 10th grade. The main portion of the study involved testing the

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Item 20 Continued:

comprehensibility of each regulation to its user audience by means of the CLOZE procedure. In this testing method, every fifth word of a passage taken from the regulation was deleted, and personnel were asked to fill in the blanks with their best estimates of the missing words. A criterion of a CLOZE score (40%) corresponding to a 75% score on a traditional comprehension test was set as the standard for adequate comprehension. Mean scores in three fields were clearly above criterion, and the score in one additional field was borderline. Using the term literacy gap to refer to a situation where a text is written at an RGL too high for its intended readers, it was found that in all cases when there was no such gap, comprehension was adequate. In all these cases, however, audience RGL was also quite high. In three of the four instances where a literacy gap did exist, comprehension scores were below criterion. In all three of these cases, RGL was low (below 9.2).

PREFACE

Lt Col Brian Waters provided important assistance in planning and designing this study. Mr. Vincent Maurelli made significant contributions in developing, administering, and scoring the tests, and Ms. Linda Waddelow's help in data analysis was invaluable. A large number of people provided technical assistance: Dr. George Klare of Ohio University stands out among them for his particularly significant and helpful counsel. Finally, gratitude for their help in identifying and obtaining Air Force personnel as subjects is due to all the people who served as on-site project officers for the Air Force Bases to which they were assigned.

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READABILITY OF AIR FORCE PUBLICATIONS: A CRITERION REFERENCED EVALUATION

I. INTRODUCTION

President Carter, as part of his February 1977 "fireside chat," called for government publications to be made more understandable. This goal is particularly relevant in the military sector, where the clarity of written communication may be of critical importance. At the very least, regulations and directives which are not fully understood by their intended readers are likely to lead to loss or misuse of resources, as well as to lowered safety and morale. Moreover, the uniformity of procedures could also suffer significantly. If regulations, directives, etc. are written so that a significant number of their readers have difficulty in understanding what has to be done, tasks may be performed incorrectly or not at all. Indeed, some individuals may abandon attempts to understand any written communications of this type.

In response to the President's remarks, a decision was made by the Air Force to reduce the number of publications and to render those which were retained more understandable to their intended users. In furtherance of this latter goal, direct attempts were made to

1. Identify the target audience for each Air Force publication.
2. Compute a quantitative measure of this audience's reading grade level.
3. Calculate a comparable index of the reading level of each publication.
4. Require technical writers to eliminate or reduce identified "literacy gaps," i.e., discrepancies between the reading grade level (RGL) of personnel and the readability of the materials they use in their jobs.

A study by Mockovak (1974) laid the groundwork for this effort. Mockovak estimated the reading ability of personnel from the 3 and 5 skill levels in 56 Air Force career ladders. He used the Madden-Tupes (1966) regression equation for predicting the RGL from Airman Qualifying Examination scores. He also estimated the reading level requirements of written material in each of the 56 ladders; this requirement was defined as the reading grade below which 85% of the appropriate material fell. The readability of each publication was determined by the FORCAST readability formula (see Figure 1). This formula, which was developed using Army technical training materials and normed with Army personnel (Caylor, Sticht, Fox, & Ford, 1973), estimates a materials readability level based on a syllable count from a 150-word sample. A "literacy gap" indicator was then computed by comparing the RGL of career field incumbents with that of the job reading materials. Of the 56 career levels considered, 43 were found to have negative literacy gaps, i.e., the reading requirements of materials exceeded the mean RGL of the intended audience. Of these, five had a negative gap of three or greater, another 13 had a gap of two or greater, and an additional 13 had a gap of one or greater. Thus, 55% of the career ladders investigated (31/56) evidenced a literacy gap of greater than one grade level.

These results suggested a need for revising certain Air Force publications to make them more readable by their intended users. The corrective mechanism selected by the Air Force for meeting this need is set forth in Headquarters Operating Instruction (HOI) 5-2.[1] This publication prescribes and makes mandatory a procedure for determining whether a negative literacy gap exists, as well as the measures to be taken if such is the case. Writers of publications are required to certify

[1] Headquarters Operating Instruction (HOI) 5-2, *Writing Understandable publications*, 25 March 1977, is now obsolete but has been incorporated into Air Force Regulation 5-1, *Publications management program*, 1 June 1978.

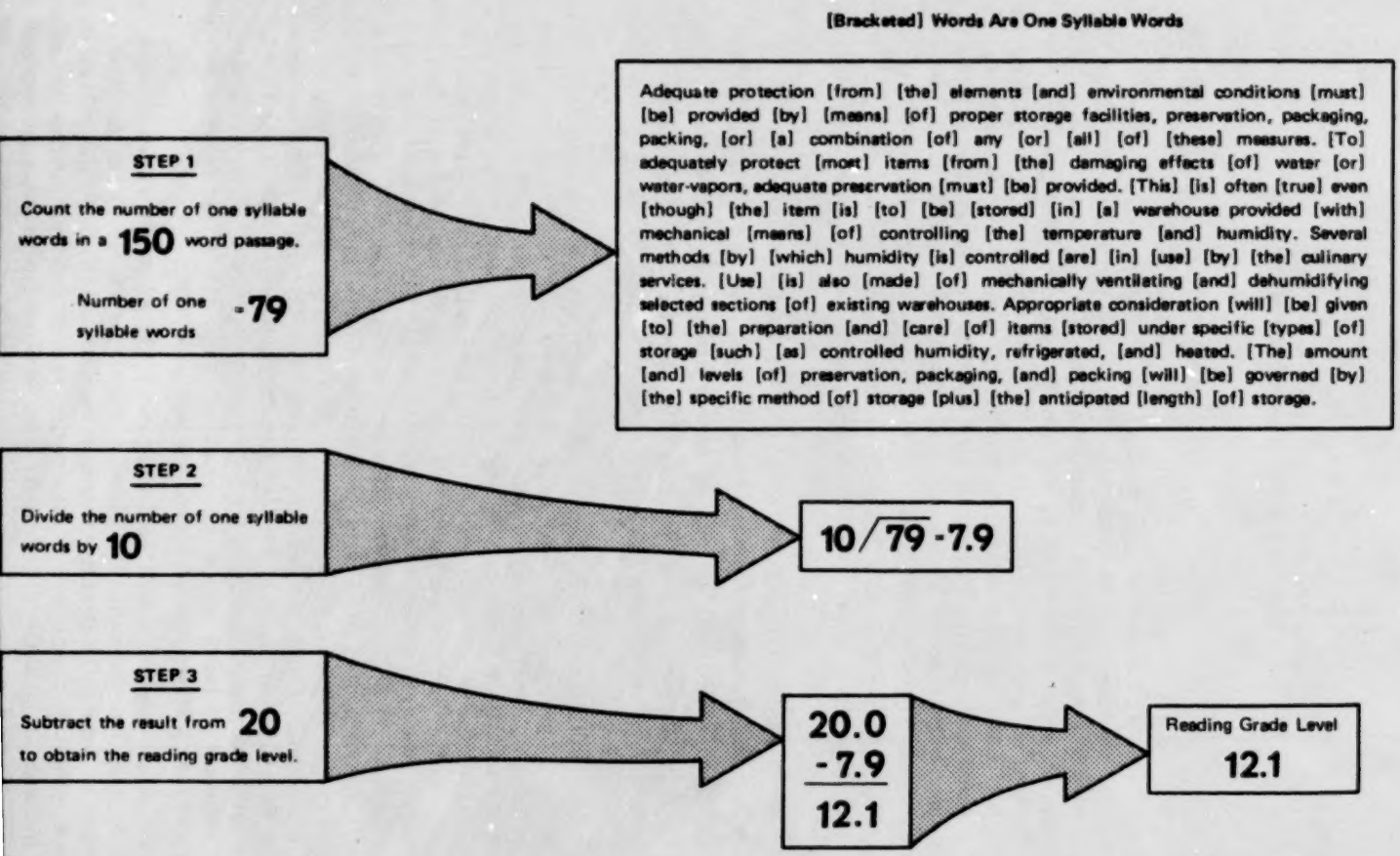
[Bracketed] Words Are One Syllable Words
Adequate protection [from] [the] elements [and] environmental conditions [must] [be] provided [by] [means] [of] proper storage facilities, preservation, packaging, packing, [or] [a] combination [of] any [or] [all] [of] [these] measures. [To] adequately protect [most] items [from] [the] damaging effects [of] water [or] water-vapors, adequate preservation [must] [be] provided. [This] [is] often [true] even [though] [the] item [is] [to] [be] [stored] [in] [a] warehouse provided [with] mechanical [means] [of] controlling [the] temperature [and] humidity. Several methods [by] [which] humidity [is] controlled [are] [in] [use] [by] [the] culinary services. [Use] [is] also [made] [of] mechanically ventilating [and] dehumidifying selected sections [of] existing warehouses. Appropriate consideration [will] [be] given [to] [the] preparation [and] [care] [of] items [stored] under specific [types] [of] storage [such] [as] controlled humidity, refrigerated, [and] heated. [The] amount [and] levels [of] preservation, packaging, [and] packing [will] [be] governed [by] [the] specific method [of] storage [plus] [the] anticipated [length] [of] storage.
STEP 1
Count the number of one syllable words in a 150 word passage.
Number of one syllable words = 79
STEP 2
Divide the number of one syllable words by 10
10/79 -7.9
STEP 3
Subtract the result from 20 to obtain the reading grade level.
20.0
-7.9
12.1
Reading Grade Level
12.1

Figure 1. **FORCAST reading difficulty level formula.**

that the reading level of the material matches that of the target audience. To make this certification, the reading level of a newly written or revised publication must first be determined by using FORCAST. If the grade level of the publication exceeds that of the intended audience, the writer must rewrite it until this is no longer the case.

II. OBJECTIVE

The objective of the present investigation was to evaluate the effectiveness of HOI 5-2 as a standard for writing Air Force regulations. In particular, it was intended to determine whether regulations written in accordance with this instruction were comprehensible to their intended user audiences. For this purpose, the Technical Training Division of the Air Force Human Resources Laboratory conducted a field study on a sample of such publications.

The central portion of this research began with the selection of regulations which had been rewritten in accordance with HOI 5-2 and submitted to AFHRL. These regulations were from seven different Air Force career fields. The next step involved ascertaining whether these regulations would indeed be comprehensible to those who had to read them in performing duties. To answer this question, two procedures were used. First, selected publications would be rechecked using the FORCAST formula to determine how successful the writers had been in meeting their goals. Second, and more important, the comprehensibility of the publications to appropriate populations was to be measured. The instrument selected to effect this measurement was the CLOZE procedure, described in detail in the next section.

A criterion-referenced approach was selected to evaluate the meaning of the CLOZE scores. In other words, rather than compare new and old versions of the same regulation, an absolute standard of comprehension was specified, and performance above standard was considered acceptable. Criterion-referenced tests are considered (e.g., Popham, 1973), to be the most appropriate measurement technique for determining whether a learning or comprehension objective has been achieved. In this case, the 75% comprehension level was deemed to be an adequate criterion, and a CLOZE score of 40% (roughly corresponding to this criterion) was selected as the standard. The mean performance of subjects in each career field relative to this standard could then be assessed. This approach to interpretation of the data would provide direct answers to the question of whether the publications sampled met the standard for being sufficiently comprehensible to their intended readers.

In addition to the CLOZE tests, a career-specific vocabulary test was developed for each of the seven fields. The objective of this part of the study was to test the validity of a claim made relative to the use of the FORCAST formula in estimating the readability of regulations. Since the FORCAST reading level estimate depends totally on the number of one syllable words in a passage, the higher the proportion of such words, the easier the passage is considered to be. Writers of Air Force regulations have argued that certain multisyllable career specific terms are so well-known to members of the field that they should be counted as one syllable words for the purposes of readability estimation. If this were the case, personnel ought to perform virtually perfectly on vocabulary tests consisting of such terms from their own fields. Including vocabulary testing in the study would prove or disprove this hypothesis.

III. METHOD

Development of Test Materials

After the Air Force regulations were rewritten by writers in the Offices of Primary Responsibility (OPR) and checked for compliance with HOI 5-2, they were submitted to AFHRL. Of the various regulations received, seven from different career fields were eventually selected to

be used in this study. This selection was dictated, first of all, by the fact that the Directorate of Administration (USAF/DA) specified that this study should include materials for each of the following career fields: (a) administration, (b) personnel, (c) a technical field, and (d) an officer career field.

In addition, criteria pertaining to the available publications themselves constrained the selection. The regulations selected had to be suitable not only for FORCAST readability estimation but suitable for the development of CLOZE tests as well. While the correct use of FORCAST requires a connected prose passage of 150 words, the minimum suitable length for a 50-item CLOZE test is 250 words. Thus, only regulations which contained at least one 250-word passage of "running text" were selected. Table 1 lists these regulations and their associated career fields and summarizes the features relevant to this study. It will be noted that the fields selected were Administration, Printing, Manpower Management, Personnel, Nondestructive Inspection, Fuels, and Information.

Table 1. **Description of Regulations**

Career Field	AF Regulation	Title	Number of Tests	Writer RGL	AFHRL RGL
Administration (702)	4-2	Developing and Managing Administrative Systems	4	10.0	11.2
Printing (713)	6-1	Policies, Procedures and Standards for Air Force Printing, Duplicating, Copying and Microfilm Production	8	9.2	11.5
Manpower Management (733)	25-5	Management Engineering Program	4	11.3	12.6
Personnel (732)	39-18	Active Duty Service Commitments	2	10.6	11.1
Nondestructive Inspection (427)	66-39	Oil Analysis Program	2	9.1	10.8
Fuels (Officer) (641)	144-1	Fuels Management	8	12.8	12.9
Information (791)	190-23	Information Audio-Visual Activities	4	11.5	11.3

Once the seven regulations were selected, tests had to be devised to measure their comprehensibility to appropriate readers. It was decided to use the CLOZE procedure to develop such tests. This procedure entails deleting every *n*th word in a prose passage, and subjects are required to fill in the blanks left by these deletions. Their ability to supply the exact words deleted is taken as a measure of how understandable (or readable) the passage is to them.

The CLOZE procedure was introduced by Taylor in 1953 as a reliable and valid test of how well a reader understands a given passage and thus how readable it is to that individual. As Klare, Sinaiko, and Stolurow (1971) argue, scores on CLOZE tests also measure how much a reader already knows about the subject matter of a text, as well as its readability. Since subjects would be asked to take CLOZE tests on revisions of regulations they were already familiar with, the factor of subject matter knowledge, as well as text readability, could be expected to enter into their scores.

The CLOZE procedure has several significant advantages over more conventional ways of testing understanding of text (e.g., multiple-choice tests). The first of these is ease of construction. CLOZE tests can be constructed by a perfectly mechanical and unambiguous algorithm. If only the exact word deleted is accepted as correct (i.e., synonyms are counted as wrong), the scoring algorithm is also unambiguous. Finally, the person devising an appropriate conventional test about a passage has to be something of an expert on the subject matter covered. Thus, if conventional tests had been used in the study under discussion here, consultation with experts in seven

different fields would have been required. All the advantages described above entered into the decision to use CLOZE tests in this study.

In developing the tests, the most common and preferred CLOZE procedure was followed, i.e., delete every fifth word of the experimental passages. One reason for this preference was that, if there are fewer than four words between deletion, completion of a blank becomes overly dependent on correct responses to previous blanks. Klare et al. (1971) claim that this is not a significant problem with a deletion pattern of every fifth word. If more than four words intervene between blanks, either the total number of potential responses becomes low, which is apt to reduce reliability, or the tests become quite long. This is undesirable if testing time is limited or only short samples of text are available.

In this study, between one and four passages were selected from each regulation to be made into CLOZE tests. In all, sixteen different passages were used. Each passage was approximately 250 words in length, so that the deletion of every fifth word yielded a test of approximately 50 items. The number of CLOZE tests created from a single regulation depended on the availability of suitable consecutive 250-word passages. Once passages had been selected, two alternate CLOZE tests were devised from each. More than one form was used in an effort to increase test score validity by sampling a larger portion of the domain of potential item responses. Thus, a total of 32 tests was created. Form A started the deletion pattern with the fifth word (i.e., words 5, 10, 15, etc. were deleted). In Form B, deletion started with the third word (i.e., words 3, 8, 11, etc. were left out). One passage from each field with deleted words underlined is given in Appendix A.

The criterion score for adequate performance, indicating sufficient comprehension, was set as 40% correct for each test. Available data (e.g., Bormouth, 1967; Rankin & Culhane, 1969) indicate that this CLOZE score corresponds to a score of 75% on a multiple-choice comprehension test covering the same material.

In constructing the seven vocabulary tests, the writers of the regulations selected for the study were asked to provide a list of the career-specific terms most likely to be well known to members of that field. These writers also supplied the correct definitions for each term. Each set of vocabulary items and definitions was then made into a matching test. The number of item-definition pairs in each test ranged from 10 to 13. There was always an extra distractor definition in each list. The seven vocabulary tests are presented in Appendix B.

Subjects

Approximately 900 Air Force personnel on 13 bases belonging to 15 major commands were tested in this study. These 13 bases were selected for use in the study because they contained substantial numbers of people in one or more of the relevant career fields. For maximum generalizability of findings, it was desirable that the subjects in each field come from the greatest feasible number of bases and major commands.

After the bases were selected, arrangements were made to obtain subjects through the consolidated base personnel offices. All members of the selected career fields at each base were contacted and asked to report for testing. Again for the sake of greater generalizability, efforts were made to test personnel in each field at several different skill levels beyond entry level. Breakdown by base and major command of numbers of CLOZE and vocabulary tests are presented in Tables C1 and C2 (Appendix C).

Test Administration

Subjects were tested in groups, the size depending on the number of personnel available. After some general instructions, CLOZE and vocabulary tests were handed out. Specific test instructions, which were printed on the first page of each test, are reproduced in Appendix D.

Each subject was required to take the CLOZE test or tests for the career field to which that subject was assigned. In general, personnel were expected to take all of the CLOZE tests prepared for their specialty. However, this was not feasible in every case, and some subjects did not complete all appropriate tests. In fields with more than one CLOZE test, subjects took the tests in the order that the corresponding passages appeared in the regulation.

Whether a given subject received Form A or Form B of a passage was randomly determined. The subjects who took Form A of the first passage in their field were equally likely to receive either of the two forms of the second passage. After completing the CLOZE tests, the subjects were administered the corresponding vocabulary test.

While no time limit was placed on any aspect of the testing session, subjects were asked to work as quickly as possible. Most subjects completed a single CLOZE test in 20 minutes or less; the corresponding time for the vocabulary test was about 10 minutes. Thus, effective testing time ranged from 30 to 90 minutes, depending on how many CLOZE tests there were for a subject to take.

Scoring

The primary scoring method for the CLOZE test counted as correct only the exact word (except for misspellings) deleted from the original passage. Each subject's responses were transcribed from the test form into a computer file without alteration. A scoring algorithm was developed and scoring was automatic.

In addition, each test was rescored counting synonyms of the initially deleted word as correct. Lists of acceptable synonyms for each response were read into the computer and scoring was again by algorithm. Vocabulary tests were hand-scored using an answer key.

IV. RESULTS

Text Difficulty

The initial analysis involved using FORCAST to recompute the RGL of the submitted manuscripts. Whenever possible, these calculations were performed on paragraphs identical to those used by the regulation writers for their sample. When this was not possible, e.g., when the original computations had been made on passages not really suitable for FORCAST, other appropriate text samples were used. The results of these calculations are given in Column 6 of Table 1.

The first result of interest concerns the comparison of the publication writers' estimates of their regulations' RGL and the corresponding FORCAST computation performed by AFHRL staff members. It can be seen from a comparison of Columns 5 and 6 of Table 1, that the writers underestimated the actual RGL of their publications by more than one grade level in four out of seven cases. If some writers were counting familiar multisyllabic words as monsyllabic, this could account for much of the discrepancy. While it is not known whether and to what extent writers actually did this, it should be noted that they had been instructed to rewrite in accordance with HOI 5-2, which does not allow this procedure.

An examination of 37 submitted regulations which were not used in this study but which had their RGLs recomputed by AFHRL disclosed the same trend. Of the 37, writer and AFHRL estimates were within 6 months of each other in 14 cases (38%). The AFHRL count was more than 6 months higher in 22 cases (59%) and was lower in one case (3%).

AFHRL staff also computed the RGL of the exact passages from the regulation used in the CLOZE tests. For all but one field, the mean FORCAST RGL for the actual test passages used differed somewhat from the estimated RGL of the whole regulation. Mean estimated test RGLs are given in Column 3 of Table 2 juxtaposed with the supposed RGL of the intended audience

Table 2. **CLOZE Test Performance for Seven Career Fields**

Career Field	Target RGL	Test[a] RGL	Lit Gap	CLOZE Score	95% Confid. Interval	Reliability	N
Administration	9.1	11.6	−2.5	30.8	28.8 to 32.8	.828	194
Printing	8.9	12.6	−3.7	27.5	25.7 to 29.3	.838	202
Manpower Management	11.3	12.3	−1.0	50.4[b]	48.8 to 52.0	.723	241
Personnel	10.5	10.4	+0.1	44.1[b]	42.8 to 45.4	.855	486
Nondestructive Inspection	8.5	10.8	−2.3	32.0	27.9 to 36.1	.870	50
Fuels	14.0	13.2	+0.8	48.0[b]	49.7 to 49.3	.640	232
Information	12.7	11.5	+1.2	41.4	38.5 to 44.9	.750	66

[a]Mean of all tests for career field.

[b]Above criterion with 95% confidence.

(Column 2). If test RGL is subtracted from target RGL, the difference is an estimate of literacy gap. These estimates are given in Column 4 of Table 2. As stated above, a negative literacy gap implies that the reading material is too difficult for the user audience.

Exact Scoring

After testing, the mean CLOZE scores for each of the seven career fields were calculated; these are displayed in Column 5 of Table 2. These scores represent the average across both versions of all tests developed for that specialty. Thus, the mean for Personnel represents the scores for two test versions of a single passage; while the score for the Fuels specialty was obtained by averaging across eight individual tests: two versions each of four test passages.

Recall that the criterion set for adequate comprehension was a CLOZE score of 40% or better. It may be seen from Column 5 of Table 2 that the mean scores from only four of the seven fields (viz., Manpower Management, Personnel, Fuels and Information) are above criterion. If the 95% confidence interval is considered, the criterion performance of subjects in the Information field is called into question. Where there is no negative gap in a field, (viz., in the Personnel, Fuels, and Information specialties) subjects have achieved above criterion scores on their CLOZE tests. Conversely, in three of the four fields where there does exist a negative gap (i.e., Administration, Printing, and Nondestructive Inspection) performance is below the 40% standard. The sole exception is the test performance of Manpower Management subjects. Data from these personnel are anomalous in several respects, as will be discussed below.

Table 2 shows that, for each career field where the members perform below criterion, the target RGL is below 9.6. Conversely, the target reading grade level for the fields where subjects do perform adequately is in every case above 10.4. Thus, the target reading level of the user audience is confounded with the variable of literacy gap in six of seven cases. In other words, the failure to reach criterion could be directly related to literacy gap, or it could be due merely to the fact that the target RGL was low in an absolute sense. In the one case (Manpower Management) where target RGL and direction of the literacy gap yield conflicting predictions, the prediction based on target RGL is confirmed.

Data broken down by the 32 individual tests appear in Table 3. A comparison of Columns 3 and 7 shows that the relationship between the sign of the literacy gap and whether CLOZE scores are above criterion was as predicted in 27 out of 32 cases. By the binomial theorem, the probability of this happening by chance is less than .001.

CLOZE Test Reliability

A coefficient of internal consistency (Cronbach's alpha) was computed for each separate test. If an alpha of .75 is considered acceptable, Column 5 of Table 3 shows that 11 of the 32 tests

Table 3. **Description of Individual Tests and CLOZE Performance**

Career Field (Target RGL)	Test	RGL	Gap	CLOZE	N	SD	Alpha
Administration (9.1)	1A	10.9	−1.8	33.1	49	13.	.82
	1B	10.9	−1.8	40.4	50	12.2	.82
	2A	12.3	−3.2	22.1	67	10.6	.81
	2B	12.3	−3.2	30.3	28	12.9	.86
Printing (8.9)	3A	12.1	−3.2	32.0	28	10.2	.76
	3B	12.1	−3.2	25.6	23	10.3	.75
	4A	13.5	−4.6	19.2	28	11.8	.88
	4B	13.5	−4.6	28.6	23	11.6	.85
	5A	12.4	−3.5	31.3	25	13.2	.87
	5B	12.4	−3.5	24.9	25	12.7	.86
	6A	12.6	−3.7	33.0	24	13.7	.86
	6B	12.6	−3.7	25.7	26	13.2	.87
Manpower Management (11.3)	7A	11.1	+0.2	45.4	69	9.2	.70[a]
	7B	11.1	+0.2	41.6	53	9.5	.74[a]
	8A	13.6	−2.3	60.1	60	11.6	.76
	8B	13.6	−2.3	54.4	59	9.4	.69[a]
Personnel (10.5)	9A	10.4	+0.1	43.4	261	13.3	.84
	9B	10.4	+0.1	44.9	225	14.7	.87
Nondestructive Inspection (8.5)	10A	10.8	−2.3	34.7	28	13.3	.85
	10B	10.8	−2.3	28.6	22	15.3	.89
Fuels (14.0)	11A	13.0	+1.0	51.7	31	11.3	.76
	11B	13.0	+1.0	49.9	27	11.7	.79
	12A	13.3	+0.7	52.2	28	8.7	.68[a]
	12B	13.3	+0.7	46.0	30	8.0	.57[a]
	13A	14.0	0.0	51.2	31	7.3	.41[a]
	13B	14.0	0.0	40.8	27	7.4	.62[a]
	14A	12.3	+1.7	45.6	29	10.4	.73[a]
	14B	12.3	+1.7	46.1	29	8.0	.61[a]
Information (12.7)	15A	10.5	+2.2	39.8	21	10.5	.77
	15B	10.5	+2.2	52.9	11	11.6	.80
	16A	12.5	+0.2	44.9	14	9.7	.70[a]
	16B	12.5	+0.2	34.2	19	9.5	.73[a]

[a]Alpha < .75.

are of questionable reliability. These tests come from three career fields: three from Manpower Management, six from Fuels, and two from Information. Predictably, the mean reliability for Manpower and for Fuels is below standard, while that for Information is borderline. In all cases where reliability is below standard, the variability of the scores themselves is low (s.d. < 10); this is particularly true of scores in the Fuels field.

Synonym Scoring

In addition to exact scoring, all CLOZE tests were scored by counting as correct all synonyms of the originally deleted words. Lists of acceptable synonyms were developed for each test by one of four AFHRL staff members. Synonym lists for two of the passages (Fuels and Personnel) were developed independently by three scorers, average interscorer agreement was 92% for the Fuels passage and 98% for the Personnel passage. Table 4 gives the synonym scores for each field juxtaposed with exact scores. Across the 32 tests used, the Pearson correlation coefficient between exact and synonym scores was r = .95; across the seven regulations, r = .94.

Table 4. **Exact and Synonym CLOZE Scores and Vocabulary Scores for Seven Career Fields**

Career Field (Number of Tests)	Exact Score	Synonym Score	Difference	Vocabulary Score
Administration	30.8 (194)	42.1	11.3	70.2 (100)
Printing	27.5 (202)	33.4	5.9	63.8 (51)
Manpower Management	50.4 (241)	62.4	12.0	73.5 (124)
Personnel	44.1 (486)	56.9	12.8	87.1 (483)
Nondestructive Inspection	32.0 (50)	44.0	12.0	94.6 (50)
Fuels	48.0 (232)	59.1	11.1	98.4 (57)
Information	41.4 (66)	51.0	9.6	63.3 (33)

The scores generated by counting only exact words as correct might seem to yield a less valid picture of the degree of comprehension than synonym scoring. After all, to understand a passage is virtually always identified with grasping its meaning. From the standpoint of meaning, synonyms are equivalent. Nevertheless, the criterion in this study was set in terms of exact CLOZE scores because equivalence to conventional measures of comprehension has been established only for them (Bormouth, 1967, 1968; Rankin & Culhane, 1969). Correlations were computed because high correlations were expected from the literature and it would have been interesting if the present data were atypical in this way. Furthermore, high correlations would mean that synonym scores could be well predicted from exact ones and would thus indicate that there was little information to be gained by developing criteria for synonym scores. High correlations were indeed the rule.

Column 4 of Table 4 gives for each field the difference between mean synonym score and mean exact score. This difference can be thought of as an index of the degree to which subjects understood the meaning or gist of the test passage without being able to come up with the exact term deleted. It may be noted that the synonym-exact score difference for the Printing passage was much smaller than it was for any of the others. When an analysis of variance was performed on these difference scores, the effect of field was indeed highly significant ($F(6,1464) = 41.5$, $p < .001$). This seems to indicate that understanding of the

gist of the Printing passage was particularly poor, perhaps poorer than the very low exact CLOZE scores indicate. The impression made by the reading of this passage (Appendix A) is highly compatible with the idea that it was particularly difficult to read and comprehend.

Effect of Skill Level

The variation of CLOZE scores as a function of skill level can be observed in Table 5. A separate analysis of variance was performed for the factor of skill level within each field. The main effect of level was significant for five of the seven career fields; viz., Administration, Printing, Personnel, Nondestrictive Inspection, and Information. In general, the CLOZE performance improved as the skill level went up. In four cases, personnel at low skill levels got higher scores than those at intermediate levels. However, in all these cases, the number of subjects at low levels was small. For the Manpower Management and Fuels fields, there is no effect of skill level on CLOZE scores. It will be remembered that these were the two fields where tests score reliability was low due to low score variance. Note too that in these fields scores are uniformly high. The implication is that these tests were relatively easy so that good performance was not dependent on job knowledge.

Table 5. **CLOZE Scores Broken Down by Skill Level for Seven Career Fields**

Career Field (Number of Tests)	1–3 Level	5 Level	7–9 Level	F Value; Probability
Administration	32.4	28.4	37.1	F = 7.4
	(15)	(118)	(48)	p<.001
Printing	24.5	25.5	37.3	F = 13.2
	(38)	(126)	(31)	p<.001
Manpower Management	51.0	—	50.3	F<1
	(30)		(211)	
Personnel	37.1	41.1	48.3	F = 21.7
	(36)	(207)	(229)	p<.001
Nondestructive Inspection	31.3	23.4	36.5	F = 4.5
	(8)	(14)	(28)	p<.05
Fuels	47.4	46.6	48.7	F<1
	(36)	(53)	(143)	
Information	44.5	35.4	45.4	F = 6.02
	(2)	(25)	(37)	p<.01

Vocabulary

Data on vocabulary scores are given in Table 6. Mean vocabulary scores are juxtaposed with CLOZE scores for the same field in Table 4. The hypothesis being tested was that these terms would be responded to by field members with virtually perfect accuracy. If a rather lenient standard of 90% is identified with this claim, it can be seen that only members of the Fuels and Nondestructive Inspection fields have attained this criterion. (It is noteworthy that in the case of Nondestructive Inspection, high vocabulary scores coexist with low CLOZE scores.) If a standard of 75% correct is set as the minimally adequate level of job term knowledge, only one more field, Personnel, shows acceptable performance. Four of the seven career fields failed to achieve even minimally acceptable performance.

Table 6. **Vocabulary Test Performance for Seven Career Fields**

Career Field	Vocabulary Score	N	95% Confidence Internal	Alpha
Administration	70.2	100	66.4 to 74.0	.71
Printing	63.8	51	58.5 to 69.1	.65
Manpower Management	73.5	124	69.9 to 77.1	.71
Personnel	87.2	483	85.7 to 88.7	.71
Nondestructive Inspection	94.6	50	91.7 to 97.5	.59
Fuels	98.4	57	97.5 to 99.3	*
Information	63.3	33	55.9 to 70.7	.70

* Alpha could not be computed due to low item variance.

While the large differences among career fields in vocabulary scores could be attributed to large variability in the difficulty of the tests, it should be emphasized that specialists in all seven fields were given the identical specifications for selecting these terms. The resultant list of words should have been the most familiar ones in a career field and equally familiar to the job incumbents of that field.

A breakdown of vocabulary scores by skill level within each field can be seen in Table 7. For four of the fields the main effect of skill level is significant by an analysis of variance. In all of these fields, subjects at high skill levels receive better scores than those at low and intermediate ones. The effect of level is not significant for Manpower Management, Fuels, and Information.

Table 7. **Vocabulary Scores Broken Down by Skill Level for Seven Career Fields**

Career Field (Number of Tests)	1–3 Level	5 Level	7–9 Level	F Value; Probability
Administration	61.5	68.6	80.2	F = 5.3
	(11)	(57)	(26)	p<.007
Printing	62.5	59.4	81.8	F = 5.7
	(8)	(32)	(9)	p<.006
Manpower Management	80.7	–	72.6	F = 2.1
	(14)		(110)	p<.15
Personnel	84.5	81.5	92.6	F = 28.4
	(40)	(201)	(224)	p<.001
Nondestructive Inspection	91.3	89.3	98.1	F = 4.5
	(8)	(14)	(27)	p<.02
Fuels	97.9	99.4	98.1	F<1
	(8)	(14)	(35)	
Information	30.0	60.8	65.6	F = 1.5
	(1)	(13)	(18)	p<.2

V. DISCUSSION AND CONCLUSIONS

The first conclusion to be drawn from this study is that a substantial number of those responsible for rewriting Air Force regulations according to HOI 5-2 are not able to use the FORCAST formula to estimate accurately the RGL of their publications, nor were they hitting the

target level of their intended audience. The data indicate that this was especially true when the target RGL was low, below tenth grade. Rewriting Air Force publications to have a low RGL is indeed an extremely difficult task. Most publications must contain a large number of multiword, multisyllable terms which are fixed, i.e., may not be simplified. After all, the title of a regulation cannot be paraphrased or a specific piece of aircraft equipment cannot be renamed; however, this does not cause problems when the target RGL is relatively high and little or no rewriting is required. In spite of the fact that the writers whose publications were used in this study were required to write so that they matched the reading ability of the intended users, none were able to produce a document with an estimated RGL (as computed by AFHRL) below tenth grade.

The next set of conclusions to be drawn concerns the CLOZE scores. First, the data indicate that when the target RGL is relatively high and there is no negative literacy gap, comprehension of career field relevant regulations is acceptable, as indicated by the fact that CLOZE scores are above the 40% criterion. This would seem to be true even in the case of the Information field, where vocabulary scores reveal a striking lack of familiarity with job-specific terminology. On the other hand, where the RGL of the audience is low (< 9.5), there does tend to be a literacy gap and CLOZE scores are below criterion, indicating inadequate comprehension. This is true even in the case of the Nondestructive Inspection field where vocabulary scores indicate high familiarity with career specific terms.

As stated in the results section, in the one case (that of Manpower Management) where there did exist a negative literacy gap, but user RGL was moderately high, the prediction following from the target level was confirmed, i.e., performance was above criterion. Thus, this study provides no positive evidence that literacy gap has an independent effect on comprehension, over and above the effect of low reader RGL. It can be noted here that in a related AFHRL study (Kniffin, Klare, Stevenson, Entin, & Slaughter, 1979) which used a factorial design, there was a small but significant effect of literacy gap on comprehension. The presence and magnitude of the effect of negative literacy gaps on Air Force publications would have important implications for policy regarding these publications. For this reason, it is recommended that a study be performed which separates the effects of literacy gap and low reader RGL, using materials and CLOZE tests comparable to the ones in the present investigation.

It should also be noted that there is some possibility that the FORCAST estimate of reading level for the Manpower passage is too high. FORCAST is a predictor which takes account of only one of the known sources of text difficulty, and it is thus not perfectly correlated with actual comprehensibility. It is certainly possible to imagine a very difficult passage with relatively low FORCAST score or, conversely, a very comprehensible text with a high FORCAST estimate. There is some reason to believe that the passage given to the Manpower Management subjects belongs to the latter class. The first piece of evidence for this claim involves the fact that, although these subjects perform quite badly on the vocabulary test, their CLOZE scores are the highest in the study. Their scores even surpass those of the Fuels subjects, who, being officers, are of substantially higher educational level and whose performance was nearly perfect on the vocabulary tests. Also suggestive is the fact that performance on the Manpower CLOZE test appears to be independent of job knowledge as indicated by the lack of effect of skill level. CLOZE performance improves with skill level for all other non-officer fields. In an informal follow-up experiment, the Manpower CLOZE tests were given to several people working at AFHRL who had no knowledge of the field. Performance was uniformly high, as good or better than that of the experimental subjects.

The significant increase in CLOZE score with skill level for five of the seven fields is, first of all, some indication that, as argued in a previous section, these particular CLOZE scores are reflections not only of passage readability, but of field knowledge as well. It is rather encouraging that the effects of job experience can be seen to counteract the inherent difficulty of job-related reading materials. However, it should be noted that in only one case (that of Personnel), where performance of low skill level subjects is below criterion, do those at higher skill levels perform satisfactorily.

The main conclusion to be drawn from levels of performance on the vocabulary tests is that there is no basis for counting supposedly well-known career specific terms as one syllable words for the purposes of FORCAST estimates of the RGLs of Air Force regulations. The justification offered for so doing was that such terms are, to members of the appropriate fields, as familiar and easy to understand and deal with as common one-syllable words. The results of this study show that this is far from being generally true; Air Force publications directed at personnel with relatively low reading ability were generally too difficult for their user audiences. Allowing writers to count career specific terms as monosyllabic would simply exacerbate this problem further. Moreover, the Nondestructive Inspection field provides an example of personnel showing high familiarity with career terms, yet indicating by their CLOZE scores that they were not comprehending regulations written for them.

Finally, the low level of performance on vocabulary tests in four out of the seven fields demonstrates that the regulation writers, who submitted these terms as well-known, were overly optimistic with regard to the actual abilities and knowledge of their intended audiences.

As was the case with the CLOZE scores, vocabulary scores increased significantly with skill level in the majority of the career fields investigated. This is some rough indication that the writers did at least choose career field appropriate words. This finding also provides an encouraging confirmation that job-appropriate knowledge does increase with skill level.

Implications for the Air Force

The results of this study imply that

1. Writers of Air Force publications and regulations should get additional training in the use of the FORCAST formula and in ways to decrease the RGLs of their texts.

2. For the purposes of FORCAST RGL estimation, "familiar" multisyllabic words should not be counted as words of one syllable.

3. The policy of writing to target audience should be continued but should not be enforced rigidly. Given the relatively crude ways employed at present to estimate literacy gap, it is probably not appropriate to insist that writers hit their targets with a great deal of precision. Additionally, the practical problems involved in simplifying materials below tenth grade level may be insurmountable.

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APPENDIX A: CLOZE TEST PASSAGES (ONE FROM EACH FIELD) –
Words deleted in Form A Underlined; Words deleted in Form B Double Underlined.

AFR 4-2 Administration (702)

DETERMINING SYSTEM REQUIREMENTS CONSIDERING CENTRALIZATION IN SYSTEMS DESIGN. The system design depends on two characteristics; whether work is to be centralized or decentralized; and whether the work is to be assigned on a general or specialized basis. The system may be centralized, but the jobs may be customer oriented. For example, each person in the center could support a specific customer or groups of customers; or, one or more positions may support specific customers, while the rest of the positions support all other customers. Centers can thus be designated to satisfy both unique and general needs.

Centralization refers to the place where the work is performed. The designer must ask whether tasks such as typing, filing, and telephone answering can be done at one location for several office activities.

Task specialization refers to the number of different tasks done by one person. The designer must ask whether the work will be assigned so that one person types, another files, and another answers telephones, or whether all three will type, file, and answer telephones.

Doing the work from a central location, with each person doing special tasks (specialization) results in high productivity; however, responsiveness and quality depend chiefly on good management. For example, to make sure that the work is done on time, it may be assigned a priority. To assure quality, the finished work may be reviewed for accuracy.

Suggested configurations to handle various typing workload are: centralize and specialize (work assigned to a typist trained in that specific kind of work) if there is a variety of documents to be typed.

DUPLICATING ACTIVITIES, RELATED EQUIPMENT, PROCEDURES, AND REPORTS ESTABLISHMENT AND USE OF ACTIVITIES. Attachment 11 describes responsibilities for managing reproduction services at base level. The host base DA provides duplicating support to Air Force activities and ensures that activities use facilities that are available to the maximum (Paragraph 4-4). If facilities are not availabe or not adequate, the host DA, with the approval of the host command DA, takes action to establish a duplicating capability or improve duplicating service (see paragraphs 1-6 and 1-7). Duplicating activities, their use, and requirements are listed below:

(1) Duplicating Centers. Duplicating centers (on base or cff-base) are authorized to provide service outside their assigned locations. The DA ensures that such service is kept to a minimum.

(2) Duplicating Facilities. There are times that some equipment must be operated at special locations and at close support (for example command post, procurement, supply, hospitals, and operations that work round-the-clock). If it is not possible for the host base DA to operate the equipment during such times, special facilities are authorized. The DA is responsible for managing and controlling the special facilities but the users operate them with their own people. EXCEPTION: Photostat or diazo equipment for producings, drawings, schematics, charts, etc, that are not feasible to produce in printing plants or duplicating centers. Such equipment (listed in TAs that apply) is managed and operated by the organization to which the TA applies.

(3) Duplicating Requirements. Duplicating activities should be manned and equipped to produce work needed by a one-shift operation, with temporary peak loads being met by using temporary, part-time or intermittent personnel, or by using overtime.

AIR FORCE MANAGEMENT ENGINEERING PROGRAM DEVELOPMENT AND MAINTENANCE OF STANDARDS. Manpower standards are built on the premise that there is commonality among like functions. Functional directives, like equipment and like facilities tend to standardize work so that manpower standards can be built for use at more than one location. On the other hand, where there are great variations in missions, policies, equipment, or facilities, a separate standard may be needed for a specific location or for groups of locations. Where there are less significant variances at certain locations, an exception to the standard may be needed.

Normally, standards are built by doing detailed work measurement studies or by using past data to do statistical studies.

Some common MEP ways with guidance are in Volume II of this regulation; however, MEP development efforts are not limited to that guidance.

Major commands (MAJCOMs)* are encouraged to find and use new and innovative techniques in the standards development process, and when used, to document them for the reviewing and approving officials. This documentation must include justification for the approach with assumptions, and the technique must be fully explained. These innovations may give an improved methodology for a more effective MEP. However, regardless of the innovation, manpower standards must give a credible basis for allocating and distributing the manpower resource.

MEP personnel must participate fully with HQ USAF and MAJCOM functional officials to insure that current procedures, methods, and work are essential, standardized, and cost effective. This is a fundamental element in each manpower standards study and provides the functional manager with an improved and productive mission performance capability.

ACTIVE DUTY SERVICE COMMITMENTS (ADSCs) HOW ADSC DATES ARE USED. The ADSC may be less than the obligated service in the enlistment agreement; but, it does not reduce the period of obligated service. ADSC dates are important when airmen apply for separation or retirement to be effective before they complete their obligated service. ADSC dates do not keep an airman from applying for separation or retirement, but the reasons for waiving the ADSC must be put in the application.

WHO INCURS ADSCs. Tables 1, 2, and 3 list the ADSCs for airmen who go PCS, get promoted to the grades of E7, E8, or E9, or who attend education or training courses.

The ADSCs for training and PCS are less than or equal to the retainability requirements in AFRs 39-4 and 39-11. Airmen who cannot, or do not want to, get the retainability for the PCS or training may be directed on the PCS or training. They do not have to serve past their obligated service, but they may get ADSCs past their obligated service. If they reenlist or extend, then these ADSCs apply to them.

The ADSCs for promotion to the grades of E7, E8, and E9 apply to airmen who can retire within 2 years after their promotion. They must serve at least 2 years of AD in their new grades.

HOW ADSC DATES ARE COMPUTED AND RECORDED. MOST ADSC dates for PCS, promotions, and training are computed at AFMPC on the update of related data. In such cases, the ADSC date and reason flow in-system. This automatically updates the BLMPS files.

AFMPC sets up some ADSCs on a case-by-case basis to meet unique situations.

AFR 66-39 Nondestructive Inspection

AIR FORCE POLICY ON OIL ANALYSIS

Air Force policy is to track the condition of equipment by analyzing used lubricating oil to enhance safety; and to reduce maintenance costs, inspection time, and system downtime.

Oil analysis is a maintenance tool. To make sure of maximum system support, oil analysis response time must be continuously evaluated, to get and keep the most cost-effective time lapse compatible with mission, safety, and support needs.

Each OAP lab must give good support to all customers. Interservice support will be done at no cost, except where Depot Maintenance Activity - Air Force Industrial Fund (DMA-AFIT) activities perform the oil analysis.

Efficient and effective interservice use of oil analysis will be achieved by consolidating labs; coordinating support; and using the same instrumentation, techniques, and procedures.

Data feedback on the accuracy of the OAP lab recommended maintenance actions will be used to judge how well oil analysis works.

Refinement of oil analysis evaluation guides and criteria is a continuing task of all participants in the OAP.

Each Air Force OAP lab must be certified by AFLC with certification program criteria developed by the JOAP Technical Support Center (TSC).

OAP labs that do all the analysis work in a geographic area are the preferred mode of operation. A base lab is set up only when true response time needs rule out the use of an area lab.

Oil used in transient aircraft will be sampled and specified by the command that owns the aircraft. Maintenance and OAP lab personnel at other than the home base will grant requests for enroute oil analysis.

FUELS MANAGEMENT POLICY AND GENERAL RESPONSIBILITIES CONSERVATION AND POLLUTION CONTROL. All fuels personnel must conserve fuel, eliminate sources of pollution, and properly store and dispose of products under FMO control. All fuels personnel must be trained concerning their responsibilities in these areas.

Fuels functions must be conducted to minimize consumption of fuel, electricity, and other energy resources. Personnel should be encouraged to suggest changes which could aid in the conservation effort. Products stored by the FMO must be conserved by proper facilities, equipment, and procedures. Fuel recovered from filter-separator sumps, pipeline low-point drains, in-line samples, and product recovery systems must be returned to active storage, once quality control personnel have approved it for normal use.

Fuel must not be dumped or drained in any manner which causes pollution. The FMO must designate interim storage and final disposition locations and procedures for off-specification bulk products and product-water mixtures under FMO control. Products not suitable for their normal use or for use in heating plants, vehicles, or firefighting training, must be collected and disposed of in accordance with TO 42B-1-23.

The FMO must know the base oil and Hazardous Substances Pollution contiugency Plan and the Spill Prevention Control Countermeasures Plan. The FMO must ensure that all fuels personnel are trained in their responsibilites under these plans.

Centralized collection and disposal of waste petroleum products for other base activities normally is not the responsibility of the FMO. However, the FMO may assist the base safety officer and the base environmental coordinator in advising other base agencies on procedural matters.

AFR 190-23 Information (791)

INFORMATION AUDIOVISUAL (AV) ACTIVITIES AIR FORCE POLICY. AV material may be used to show and explain Air Force activities. Planning is necessary to get and use such AV materials as films, still photos, audio and video tapes. AV coverage of such Air Force events as exercises, tests, and research and development, can be a part of the general information plan, or published in orders or test directives. If more than one command is involved, the Secretary of the Air Force Office of Information (SAFOI) names one of them as the prime agency, which is to set up coverage with the Aerospace audiovisual Service (AAVS) through the command AV OPR. Coverage of Air Force events with news potential should stress the use of crews from AAVS (MAC). Local film crews may be used if AAVS cannot meet the need. Policy and guidance on release of AV material to non-Government groups engaged in information activities is in AFR 190-16. These groups include theatrical, film, television and radio producers; news representatives; advertisers and contractors.

AIR FORCE AV INFORMATION MATERIAL. AV Information materials include those produced by the Air Force or industry to inform the public on Air Force subjects, or to achieve the motivational objectives stated in AFR 190-18. Although other AV material may be useful in entertaining educating, training, or informing selected audiences of some aspects of Air Force programs or procedures, they are considered "Information" materials only if they meet the requirements stated above.

There are three main ways to get official Air Force AV material for information.

APPENDIX B: VOCABULARY MATCHING TESTS

Administration (702)

1. Administration	___	A.	Telephone equipment or systems.
2. Administrative Support	___	B.	The act of getting administrative communications to addressees.
3. Administrative Communications	___	C.	Groupings of related paperwork (correspondence) pertaining to a specific action or file.
4. Communications Support	___	D.	A function (organization) responsible for establishing policy and providing services concerning paperwork creation, reproduction, distribution, filing, storage, recall, and disposition.
5. Correspondence	___	E.	A typewriter that records on a magnetic media for future revision or playback.
6. Dictation	___	F.	The people and equipment used to satisfy office work (typing, mail distribution, filing, etc.)
7. Distribution	___	G.	Official mail, such as letters, messages, etc.
8. Documentation	___	H.	Official mail.
9. Magnetic Typewriter	___	I.	Either the act of a secretary using shorthand to record verbal correspondence for later transcription (typing), or equipment used for transcription.
10. Microform	___	J.	The act of altering a sequence of letters to change the spelling.
11. Publications	___	K.	The act of producing multiple copies of the same document.
12. Reproduction	___	L.	The act of typing using verbal input from shorthand notes or from dictation equipment.
13. Transcription	___	M.	Photographic reproduction of graphic matter.
		N.	Film on which images are recorded in greatly reduced size.
		O.	Directives published by Air Force activities.

1. Aperature Card _____
2. Bleed Edge _____
3. COM _____
4. Emboss _____
5. Engrave _____
6. Masthead _____
7. Perfecting _____
8. Presensitized Plate _____
9. Saddle Stitching _____
10. Self Cover _____
11. Thermographic _____

A. A general term applied to any printing plate produced by etching or cutting.

B. A printed image which extends to trim edge of a sheet or page.

C. A film with an emulsion optimized for the reversal process.

D. Raised printing produced by sprinkling a resinous raising compound over wet inked image and heating the sheet.

E. Fastening a booklet by wiring (stapling) it thru middle fold of sheets.

F. An image impressed in relief to achieve raised surface.

G. A metal or paper plate that has been precoated with a light-sensitive emulsion.

H. A cover of same weight paper stock as inside text pages.

I. A three-dimensional impression of relief which is the reverse of that actually existing.

J. Microfilm containing data produced by a recorder from computer generated electrical signals.

K. An electronic adding machine card with an aperature (opening) in right end which holds a 35mm film frame.

L. The name of the newspaper or periodical displayed on the top of the first page.

M. A press which prints both sides of the paper in one pass.

1. Allowance Factor _____
2. Assumed Workload _____
3. Fatigue Allowance _____
4. Inferred Workload _____
5. Manhour _____
6. Mavericks _____
7. Nontransferrable Work _____
8. Performance Rating Factor _____
9. Leveled Time _____
10. Work Sampling _____

A. Workload performed by a given work center, but which is defined as the responsibility of another work center.

B. Those data points that do not conform to the general pattern or trend described by a data array of scattergram,

C. Work that is essential to the work center and must be accomplished at a specific time or period.

D. The average number of hours per week an individual is required to be on duty.

E. A unit for measuring work. It is equivalent to one man working at normal pace for 60 minutes, two men working at normal pace for 30 minutes, or a similar combination of men working at normal pace for a period of time.

F. A numerical index that relates an observed performance to a defined normal performance.

G. The absence of delay in acquisition, transmission, and reception of data.

H. Work being accomplished which is not normally necessary to work center productivity.

I. Time included in the standard to allow for decreases or losses in production which might be caused by weariness.

J. The application of statistical sampling theory and techniques to the study of work systems.

K. Actual productive time adjusted to account for differences in pace on the part of the workers observed.

L. A coefficient which when applied to productive time results in the product allowed time.

1. PCS ____
2. Extension of Enlistment ____
3. Separation ____
4. Retirement ____
5. Service Retainability ____
6. In-System ____
7. BLMPS ____
8. TAFMSD ____
9. Command-Sponsored Dependent ____
10. CONUS ____
11. COT ____
12. DEROS ____

A. An assembly of procedures, processes, methods, routines, or techniques united by some form of regulated interaction to form an organized whole, specifically designed to make use of automatic data processing equipment.

B. Movement to a different location for permanent duty.

C. A type of separation from active duty resulting in the member being eligible for a pension based on length of service or disability.

D. A formal modification to an enlistment contract which results in an increase in the total obligated active service.

E. Process by which personnel actions and information flow through automatic data processing channels between base, MAJCOM, and AFMPC.

F. The order to active duty of certain members of the Air Reserve Forces who fail to satisfactorily participate in training.

G. The minimum period of active duty which a member should have following PCS, training, and other personnel actions.

H. A standard computer supported personnel management process structured upon a base level computer file of personnel data.

I. DOD directed procedure to standardize format and data elements for item and financial data flow between inventory control points and storage locations.

J. The date on which a member initially entered active duty, adjusted for breaks in service.

K. United States territories located within the North American continent between Canada and Mexico.

L. Entitled to travel to oversea commands at Government expense and indorsed by the appropriate military commander to be present in a dependent status.

M. An oversea tour which begins after completion of a preceding oversea tour without an intervening CONUS assignement.

1. Wearmetals _____
2. Interservice Logistics Support _____
3. Feedback _____
4. Transient Aircraft _____
5. Contaminants _____
6. Oil Breakdown _____
7. Closed Lubricating System _____
8. Lead Command _____
9. Sampling Interval _____
10. Wearmetal Guide _____

A. The agency most directly responsible for taking an action.

B. A system in which no outside source of oil can be introduced without manual intervention.

C. Includes those aspects of operations which deal with other logistic and administrative services.

D. Return of information an oil sample results.

E. The period of time which elapses between taking samples.

F. Most desirable result achieved with the minimum expenditure of manpower and dollars.

G. Metal particles which are contained in used oil and identified by using a spectrometer.

H. Criteria specifying the amount of wearmetal which a sample can contain before certain reports must be made.

I. An aircraft away from its home station.

J. A condition where the lubricating qualities of oil are reduced.

K. Logistics support provided by a joint arrangement between the military services.

L. Foreign material contained in used oil which is analyzed by means other than a spectrometer.

1. Augmentee _____
2. Bulk Petroleum Products _____
3. Conservation _____
4. Contingency _____
5. Cryogenics _____
6. Discrepancy _____
7. Fueling Unit _____
8. Identaplate _____
9. Maximum 1-Day Requirements _____
10. Mobility _____
11. Pollution _____
12. Preventive Maintenance _____

A. Possible future event or action.

B. Impure due to introduction of a foreign material.

C. A plastic "credit card" used to record aircraft data during the fuel issue/defuel process.

D. The release of foreign substances from their proper area of use or storage into the environment.

E. A fault, error, or non-compliance with directives which has been detected or identified, normally through an inspection process.

F. A vehicle designed and used for transporting bulk petroleum products.

G. Liquids, refined from crude oil, stored in containers larger than 55 US gallons and moved by pipeline, tank car/truck, barge, or tanker.

H. Materials stored at very low temperature. Also, the study of extremely low temperatures, how to produce them, and how materials behave at those temperatures.

I. The quantity of fuel representing the greatest single 24-hour demand on a fuels function based on planned wartime aircraft activity.

J. Preservation or protection of resources from needless loss, waste, or inefficient use.

K. The capability or requirement to move quickly and efficiently to a new location to establish support operations.

L. Individual temporarily assigned to work in another task or organization to increase its manning.

M. Periodic inspections, adjustments, and minor repairs performed on serviceable equipment and facilities to ensure that they are kept serviceable.

N. A color-coded device which holds forms and instructions used by fuels operators in servicing various fuels products.

Information (791)

1. Instrumentation Photo _____
2. 16mm "B" Wind Master _____
3. Caption _____
4. Producer _____
5. Audio Visual _____
6. Motion Picture _____
7. Video _____
8. Film Clip _____
9. Documentation _____
10. National Media _____

A. Electronic TV recording/transmission system.

B. Individual with total responsibility for successful completion of audiovisual product. Includes budget responsibility and hiring of creative and technical team members. Term also used to identify company which produces audio visual end products.

C. A reproduction of a master plot.

D. Combining of pictures with sound to communicate information.

E. Documentation of R&D test events.

F. Recording with audiovisual medium, natural actions.

G. Duplicate 16mm motion picture film printed with emulsion on same side as original camera film.

H. Radio, television, newspaper and magazines that cover the US.

I. Written description of still photo or film footage.

J. Series of still frames on single piece of film when projected, gives illusion of motion.

K. Short news story on film usually about 60 seconds.

L. A negative produced from an original not necessarily at the same scale.

APPENDIX C: TABLES OF BASES AND MAJOR COMMANDS

Table C1. **Number of Tests Broken Down by Base and Career Field**
(Number of CLOZE Tests/Number of Vocabulary Tests)

Base	Career Field[a]						
	702	713	733	732	427	641	791
Langley	102/51	68/17	52/26	1/0	–	–	26/13
Lackland	41/21	–	–	226/188	–	–	–
Lowry	32/18	–	–	–	–	–	15/8
Wright-Patterson	16/8	–	64/32	–	–	72/17	14/7
Buckley	3/2	–	–	–	–	–	–
Offutt	–	84/21	48/24	–	–	16/4	10/5
Randolph	–	50/13	68/42	170/184	–	–	–
Keesler	–	–	8/0	88/89	–	–	–
Chanute	–	–	–	–	25/25	–	–
Holloman	–	–	1/0	–	13/13	–	–
Pentagon	–	–	–	–	–	76/19	–
Travis	–	–	–	–	12/12	–	–
Scott	–	–	–	–	–	68/17	–
Not listed	1/0	–	–	1/21	–	–	1/0
Total	194/100	102/51	240/124	485/461	50/50	232/57	58/33

[a]702 = Administration, 713 = Printing, 733 = Manpower Management, 732 = Personnel, 427 = Aircraft Maintenance, 641 = Fuels, 791 = Information.

Table C2. **Number of Tests Broken Down by Major Command and Career Field**
(Number of CLOZE Tests/Number of Vocabulary Tests)

Major Command	Career Field[a]						
	702	713	733	732	427	641	791
TAC	102/51	68/17	50/25	–	13/13	–	22/13
ATC	60/36	50/13	34/19	317/345	25/25	–	14/8
AU	12/6	–	2/1	–	–	7/1	3/2
AFSC	3/2	–	3/5	33/23	–	–	–
ADCOM	1/1	–	–	–	–	–	–
ARPC	2/1	–	–	–	–	–	–
AFLC	2/1	–	7/3	–	–	62/16	11/5
AFMPC	–	–	111/92	–	–	–	–
AFCS	1/0	–	12/0	1/1	–	3/0	4/0
AFMEA	–	–	82/45	–	–	–	–
SAC	–	84/21	50/25	–	–	16/4	10/5
AFISC	–	–	–	1/0	–	–	–
MAC	–	–	–	–	12/12	–	–
HQUSAF	–	–	–	–	–	76/19	–
Not listed	11/0	–	–	23/21	–	–	–
Total	195/100	202/51	241/124	486/482	50/50	232/57	64/33

[a]702 = Administration, 713 = Printing, 733 = Manpower Management, 732 = Personnel, 427 = Aircraft Maintenance, 641 = Fuels, 791 = Information.

APPENDIX D: INSTRUCTIONS FOR CLOZE TESTS

This test was made by copying a few paragraphs from a regulation. Every fifth word was left out of the paragraphs, and blank spaces were put where the words were taken out.

Your job will be to guess what word was left out of each space and to write that word in that space. It will help you in taking the test if you remember these things:

1. Write only **one** word in each blank.
2. Try to fill every blank. **Don't be afraid to guess.**
3. You may skip hard blanks and come back to them when you have finished.
4. Wrong spelling will not count against you if we can tell what word you meant.
5. Most of the blanks can be answered with ordinary words but a few will be

numbers like . . . . . 3,427 or $12 or 1954
contractions like . . . . . can't or weren't
abbreviations like . . . . . Mrs. or U.S.A.

6. Write neatly.

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